Citation:

Mozaffarian D, Psaty BM, Rimm EB, Lemaitre RN, Burke GL, Lyles MF, Lefkowitz D, Siscovick DS. Fish intake and risk of incident atrial fibrillation. *Circulation,* 2004 Jul 27; 110 (4): 368-373. Epub 2004 Jul 19. PMID: 15262826.

PubMed ID: 15262826

Study Design:

Prospective, population-based cohort study.

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To determine whether fish consumption is associated with lower incidence of atrial fibrillation.

Inclusion Criteria:

Men and women older than 65 years of age enrolled from Medicare eligibility lists in four US communities in 1989 and 1990.

Exclusion Criteria:

- Participants who did not complete a food frequency questionnaire at baseline
- Participants who had atrial fibrillation at baseline.

Description of Study Protocol:

Recruitment

Men and women older than 65 years of age enrolled from Medicare eligibility lists in four US communities in 1989 and 1990.

Design

Population-based, prospective cohort study.

Statistical Analysis

- Baseline dietary intake was assessed using picture-sort version of the National Cancer Institute FFQ
- Regression analyses was used to estimate macronutrient intakes and adjust for total caloric

intake
- A missing indicator category was used for missing FFQ responses
- Cox proportional-hazards models were used to estimate risk
- All types of fish intake (except fried fish or fish sandwich) were evaluated together, with a sum of median intake for each category
- Covariates were used to minimize potential confounding
- Time-varying adjustment and stratified analyses were used to evaluate potential mediation from intermediary myocardial infarction or congestive heart failure
- Kaplan-Meier survival methods evaluated AF-free survival according to fish consumption
- Food categories were entered as ordinal variables in tests for trend and evaluation of differences in baseline using linear or logistic regression
- Likelihood-ratio testing compared with and without multiplicative interaction terms to assess effect modification by various characteristics
- Probability values are two-tailed
- Stata 8.0 used to perform analyses.

Data Collection Summary:

- At baseline, participants provided information on their health status, medical history and cardiovascular risk factors. Participants also received clinical exams, resting 12-lead ECG, two-dimensional echocardiography, pulmonary function testing and laboratory evaluation.
- Usual dietary intake was obtained at baseline and assessed for consumption of fish (tuna, broiled and baked fish, and fried fish and fish sandwiches)
- Participants received annual physical exams through year nine and interim six-month telephone contacts
- To assess for potential missed AF outcomes, the researchers examined the results of 24-hour Holter monitoring at year five in a subset of participants.

Description of Actual Data Sample:

- *Initial N:* 5,201 men and women (gender not described)
- *Attrition (final N):* 4,815 (gender breakdown not described)
- *Age:* Mean age 72.8, range of ages 65 to 100 years
- *Source of data:* Cardiovascular Health Study (CHS).

Summary of Results:

- Mean intake of fried fish or fish sandwich was 0.7 servings per week
- Mean intake of tuna and other fish consumption was 2.2 servings per week
- Tuna and other fish consumption was associated with younger age, females and individuals with higher education
- Fried fish or fish sandwich consumption was associated with males, nonwhite and lower education
- Tuna and other fish consumption was generally associated with a more favorable cardiovascular risk profile and inversely with saturated fat intake
- Tuna and other fish consumption was positively associated with intake of alcohol, fruits, vegetables and cereal fiber

- Fried fish and fish sandwich intake was positively associated with intake of saturated fat, beef, pork and vegetables
- During 12 years of follow-up, 980 participants developed atrial fibrillation
    - In participants who consumed tuna and other fish more than five times a week, AF incidence was 19 per 1,000 per person-years compared with 33 per 1,000 person-years with intake of less than once a month (P=0.0001)
    - In the group who consumed fried fish or fish sandwich more than one time a week, AF was 27 per 1,000 person-years, compared with 22 per 1,000 person-years with intake of less than once a month (P=0.0009).
- There was a 24% lower risk of developing AF with tuna and other fish intake one to three times per month
- There was a 30% lower risk with intake of one to four times a week and 35% lower risk with intake of more than five times a week
- Fried fish or fish sandwich intake was not associated with a lower risk.

Author Conclusion:

Limitations were identified. The authors concluded that dietary intake of tuna and broiled or baked fish is associated with lower incidence of atrial fibrillation among older adults. This same effect is not suggested for consumption of fried fish or fish sandwich.

Reviewer Comments:

Intake of tuna and other fish but not fried fish or fish sandwich appears to reduce the risk of AF.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes

1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A

4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	No
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	No
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	Yes
6.6.	Were extra or unplanned treatments described?	No
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes

7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	No
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes